Stat 251 / OBEE 216, Winter 2003

HW Solutions by Katherine Hinde

Project _3_1

1. Was the proportion of infants with negative BE (acid-base balance in the blood) different from the proportion of infants with positive BE, in this study?

BE- 14/30 0.467
BE+ 12/30 0.4
BE^0 4/30

$H_o: \sigma^2_1 = \sigma^2_2$ vs. $H_1: \sigma^2_1 \neq \sigma^2_2$

a. $t = \theta - \theta / SE(\theta)$ (see below)

b. $p_1 - p_2 \pm z\ SE\ (p_1 - p_2) = .467 - .4 \pm 1.96\ (0.16955) =$ **0.067±0.332**

c. $SE(p_1 - p_2) = \sqrt{\frac{p_1 + p_2 - (p_1 - p_2)^2}{n}} = 0.16955$

a. 0.467 (BE-proportion)-)-0.4 (BE+proportion)= 0.067. The null hypothesis (skeptical response) predicts "0" as BE- and BE+ would be equal. So the t-test would be

$t = \frac{0.067 - 0}{0.16955} =$ **0.395** = % area = **.30** (df=29)=p-value **0.38 NS**

95% Confidence Interval ←---|---|---|----|-→
.26 0 .067 .4

The t-test indicates that the proportion of BE-to BE+ is not statistically significant. Additionally the 95% confidence interval includes "0" which shows no difference between the proportions of BE- and BE+. In conclusion, there is no statistical difference between the two proportions and we can not reject the null hypothesis.

2. For the two groups, D & L, are there statistical differences in the IMV levels (ventilation requirements)?

	N	Mean	SE	SD	VAR
IMV Live	14	64.07	4.579	17.12	293
Dead	16	71.87	5.678	22.71	516

$H_o: \sigma^2_1 = \sigma^2_2$ vs. $H_1: \sigma^2_1 \neq \sigma^2_2$

This analysis was done using SPSS 11 for Windows. The t-value = **1.05** (=var assumed) and 1.07 (≠variances) and p-values were **.303** and .294 respectively. Clearly, there were no significant differences in IMV levels between in the D & L groups, so we can not reject the null hypothesis. (Output from SPSS is attached)

3.What is a 95% CI for the ratio of the variances of the the groups (D vs. L) w.r.t. the concentration of oxygen in the blood stream? How do we interpret this CI?

	N	Mean	SE	SD	VAR
PO2 Live	14	106.28	9.98	39.93	1595
Dead	16	67.87	20.41	76.36	5836

$H_o: S^2_1 = S^2_2$ vs. $H_1: S^2_1 \neq S^2_2$

$F(13; 15; 0.975) = .328$ $F(13; 15; 0.025) = 2.925$

$\frac{1595}{(5836*2.925)}$ =0.093 $\frac{1595}{(5836*.328)}$ =.833

95% Confidence Interval for the variances of the means of Po2 in Live and Dead outcome groups is (**0.093; 0.833**). This interval does not include "1" so the variances are not equal and we can reject the null hypothesis.

Analysis conducted using:
SPSS 11 for windows
t-distribution/%area calculator on the SOCR
http://www.stat.ucla.edu/~dinov/courses_students.dir/Applets.dir/Normal_T_Chi2_F_Tables.htm
%area/ p-value calculator on http://statman.stat.sc.edu/~west/applets/tdemo.html
and aspects of question 1 and 3 were conducted by hand.

Data Set:

Status	D/L	pO2	BE	IMV
D	1	36	2	96
D	1	48	0	40
D	1	139	-5	65
D	1	66	0	68
D	1	47	-5	60
D	1	182	6	70
D	1	47	-7	75
D	1	75	4	120
D	1	88	-2	90
D	1	58	4	85
D	1	66	2	50
D	1	41	-1	45
D	1	33	-1	66
D	1	68	4	40
D	1	39	1	80
D	1	53	0	100
L	2	178	0	65
L	2	48	2	47
L	2	56	-2	80
L	2	65	-3	55
L	2	40	2	80
L	2	151	-4	67
L	2	281	-7	46
L	2	130	-7	55
L	2	222	3	60
L	2	70	-2	60
L	2	107	-2	100
L	2	59	1	55
L	2	38	-3	40
L	2	43	12	87

Neonatal Survival and ECMO

The data and description in this example are taken from an example presented by Charles Koppleman at the Spring 1997 NCTM Regional Meeting in Baltimore, MD.

When the respiratory system of a newborn (neonate) is not fully developed or not operating properly at the time of birth, the newborn's chances of survival are greatly reduced. One method of helping to correct this life-threatening situation is to place the newborn on a heart-lung machine called an **Extracorporeal Membrane Oxygenation (ECMO)**. The purpose of ECMO is to recirculate the blood and oxygenate it so that the lungs can rest. However, given the fragile state of a newborn in severe respiratory distress, the use of ECMO itself can be life-threatening. Therefore, ECMO should only be used on those neonates for whom survival is most uncertain.

What are the factors that most influence the probability of survival? Which factors should doctors use as guidelines for placing a neonate on a heart-lung machine?

Eight tests were performed on **30 neonates born** with potentially life-threatening respiratory distress. Fourteen survived and sixteen did not. Here are the **descriptions of the tests**:

- Status (D=deceased, L=living)
- pO2 = concentration (pressure) of oxygen in the blood stream
- BE = Base Excess = acid-base balance in the blood
- IMV = Intermittent Mandatory Ventilation = higher means lower dependence on a mechanical ventilator